

CBSE Class 10 Science
Sample Paper - 4

Maximum Marks: 80

Time Allowed: 3 hours

General Instructions:

- i. The question paper comprises three sections – A, B and C. Attempt all the sections.
 - ii. All questions are compulsory.
 - iii. Internal choice is given in each section.
 - iv. All questions in Section A are one-mark questions comprising MCQ, VSA type and assertion-reason type questions. They are to be answered in one word or in one sentence.
 - v. All questions in Section B are three-mark, short-answer type questions. These are to be answered in about 50 - 60 words each.
 - vi. All questions in Section C are five-mark, long-answer type questions. These are to be answered in about 80 – 90 words each.
 - vii. This question paper consists of a total of 30 questions.
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Section A

1. Write the formula and then balance the following equation.
Copper (II) sulphate + Oxygen \rightarrow Copper (II) oxide + Sulphur dioxide
2. What is the valency of nitrogen?
3. **Answer the questions that follows on the basis of your understanding of the following paragraph and the related studied concepts:**

It is easy to see that solar cooker devices are useful only at certain times during the day. This limitation of using solar energy is overcome by using solar cells that convert solar energy into electricity. A typical cell develops a voltage of 0.5–1 V and can produce about 0.7 W of electricity when exposed to the Sun. A large number of solar

cells are, combined in an arrangement called solar cell panel that can deliver enough electricity for practical use. The principal advantages associated with solar cells are that they have no moving parts, require little maintenance and work quite satisfactorily without the use of any focussing device. Another advantage is that they can be set up in remote and inaccessible hamlets or very sparsely inhabited areas in which laying of a power transmission line may be expensive and not commercially viable.



- i. What type of source of energy is mentioned in the above picture?
 - ii. For what purpose solar panels are used?
 - iii. Write the three advantages of solar cells.
 - iv. Why solar cooker surface is painted with black colour?
4. Following questions are based on the two tables given below. Study these tables related to blood sugar levels and answer the questions that follow.

Table A (Blood glucose chart)

	Mean Blood Glucose Level (mg/dL)
Doctor's advice needed	380
	350
	315
	280
	250
	215
Good	180

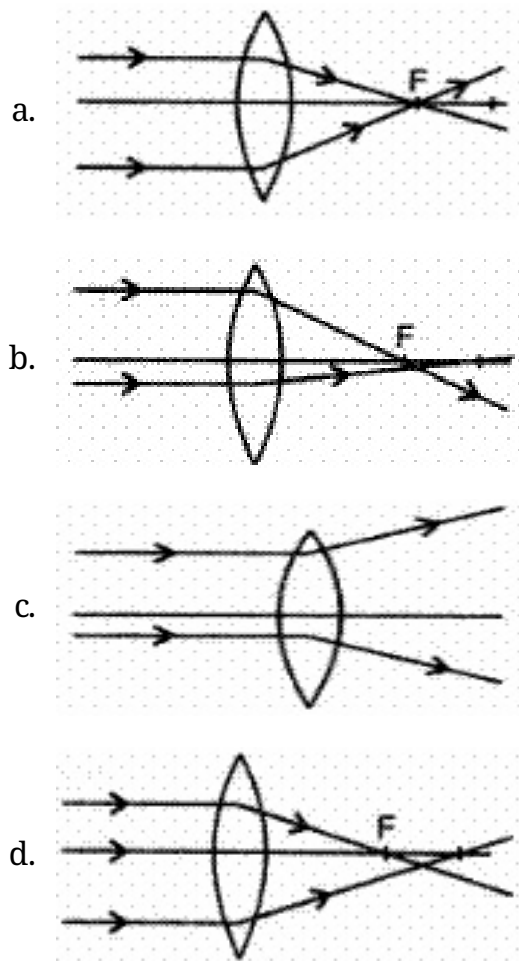
	150
Excellent	115
	80
	50

Table B (Blood Report of Patient X and Y)

Time of check	Blood Glucose ranges (mg/dL)	
	Patient X	Patient Y
Before breakfast (Fasting)	<100	70-130
Before lunch, supper and snack	<110	70-130
Two hours after meals	<140	<180
Bedtime	<120	90-15

Answer the following questions:

- Refer to Table B showing the blood report of the levels of glucose of patients X and Y. Infer the disease which can be diagnosed from the given data.
 - Identify the hormone whose level in the blood is responsible for the above disease.
 - Which one of the following diets would you recommend to the affected patient?
 - High sugar and a low-fat diet.
 - Low sugar and high protein diet.
 - High Fat and low fibre diet.
 - Low sugar and high fibre diet.
 - Refer to Table A and suggest the value of the mean blood glucose level beyond which doctor's advice is necessary:
 - 80 mg/dL
 - 115 mg/dL
 - 50 mg/dL
 - 80 mg/dL
5. Which of the following diagrams give a correct picture?



OR

In torches, search lights and head lights of vehicles, the bulb is placed:

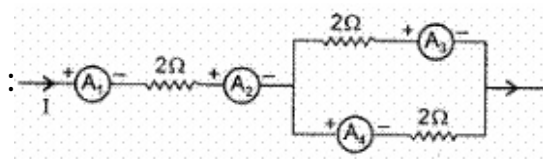
- a. At the centre of curvature
- b. Very near to the focus
- c. Between the pole and the focus
- d. Between the focus and the centre of curvature

6. Floods can be prevented by-

- a. Afforestation
- b. Tilling the land
- c. Cutting the forests

d. Removing the top soil

7. The ammeters showing equal current in the following circuit are



a. A_3 and A_4

b. A_1 and A_2

c. A_2 , A_3 and A_4

d. A_1 , A_2 , A_3 and A_4

8. Chemical formula of baking soda is

a. MgCO_3

b. Na_2CO_3

c. MgSO_4

d. NaHCO_3

OR

Four students were given colourless liquids A, B, C, of water, lemon juice and a mixture of water and lemon juice respectively. After testing these liquids with pH paper, following sequences in colour change of pH paper were reported :

[I] Blue, Red and Green

[II] Orange, Green and Green

[III] Green, Red and Red

[IV] Red, Red and Green

The correct sequence of colourless observed is

a. III

-
- b. I
 - c. II
 - d. IV

9. An example of man-made ecosystem is:

- a. Grassland
- b. River
- c. Desert
- d. Garden

10. Which of the following is non-biodegradable?

- a. Cloth
- b. Wood
- c. Plastic
- d. Paper

11. Activated charcoal is used in sugar industry as a:

- a. Decolorizing agent
- b. Reducing agent
- c. Dehydrating agent
- d. Oxidizing agent

12. The process of dissolving an acid or base in water is a highly

- a. endothermic reaction
- b. neutralization reaction
- c. displacement reaction

d. exothermic reaction

13. **Assertion:** C_8H_8 and C_4H_{10} are the successive members of the homologous series of methane.

Reason: Any two successive members in a homologous series differ in their molecular formula by a $-CH_3$ unit.

- a. Assertion is INCORRECT but, reason is CORRECT.
- b. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
- c. Assertion is CORRECT but, reason is INCORRECT.
- d. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

14. **Assertion:** When the length of a wire is doubled, then its resistance also gets doubled.

Reason : The resistance of a wire is directly proportional to its length.

- a. Assertion is INCORRECT but, reason is CORRECT.
- b. Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.
- c. Both assertion and reason are CORRECT but, reason is NOT THE CORRECT explanation of the assertion.
- d. Assertion is CORRECT but, reason is INCORRECT.

Section B

15. Why metals replace hydrogen from dilute acids, whereas non-metals do not?

16. Why does the colour of copper sulphate solution change when an iron nail is dipped in it?

OR

A solution of substance 'X' is used for whitewashing.

- i. Name the substance 'X' and write its formula.
- ii. Write the reaction of the substance X named in (i) above with water.

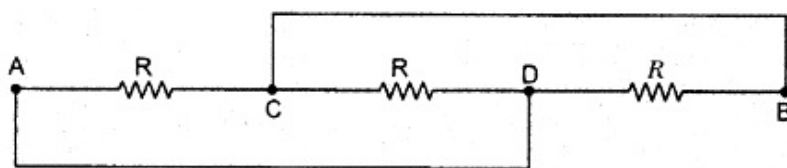
17. What is the cause of chemical combination?
18. What is transpiration? List its two functions.

OR

Why does human body urinate more in winter than in summer?

19. Distinguish between real and virtual image in a lens.
20. Draw a well labelled diagram of male reproductive system of human.
21. Mention one function for each of these hormones:
- a) Thyroxine
 - b) Insulin
 - c) Adrenaline
 - d) Growth hormone
 - e) Testosterone
22. An electric heater of resistance $8\ \Omega$ draws 15A from service mains for 2 hours. Calculate the rate at which heat is developed in the heater.

23. What is the resistance between A and B in the network shown in the figure?



24. A copper wire has diameter 0.5 mm and resistivity $1.6 \times 10^{-8}\ \Omega\text{ m}$. what will be the length of this wire to make its resistance $10\ \Omega$? How much does the resistance change if the diameter is doubled?

OR

- i. Name the spherical mirror used as:
- a. shaving mirror
 - b. Rear view mirror in vehicles

- c. Reflection in search-light.
- ii. Write any three difference between a real and a virtual image.

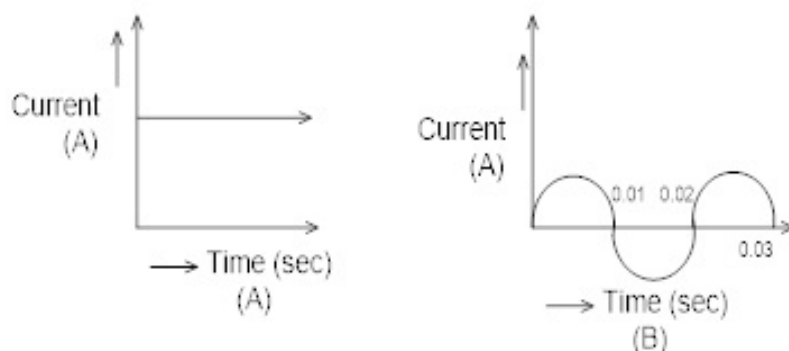
Section C

25. i. What is meant by pH?
ii. Water is a neutral substance. What colour will you get when you add a few drops of universal indicator to a test tube containing distilled water?
iii. Two solutions A and B have pH values of 3.0 and 9.5, respectively. Which of these will turn litmus solution from blue to red and which will turn phenolphthalein from colourless to pink?
26. The electrons in the atoms of four elements A, B, C and D are distributed in three shells having 1, 3, 5 and 7 electrons respectively in their outermost shells. Write the group numbers in which these elements are placed in the Modern Periodic Table. Write the electronic configuration of the atoms of B and D and the molecular formula of the compound formed when B and D combine.
27. What is ATP? Why is it considered energy currency?
28. a. What is variation? How is variation created in a population? How does the creation of variation in a species promote survival?
b. Explain how, offspring and parents of organisms reproducing sexually have the same number of chromosomes.

OR

State principle of dominance.

29. Current- time graph from two different sources are shown in the figure.



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- i. Name the type of current shown by graph (A) and (B)?
 - ii. Name any one source of shown by (A) and (B)?
 - iii. What is frequency of current in case (B)?
 - iv. Write two differences between current shown by (A) and (B)?
30. When do we consider a person to be myopic or hypermetropia? List two causes of hypermetropia. Explain using ray diagrams how the defect associated with hypermetropia eye can be corrected.

OR

- i. What is meant by power of a lens? Define its SI unit.
- ii. You have two lenses A and B of focal lengths +10 cm and - 10 cm, respectively. State the nature and power of each lens. Which of the two lenses will form a virtual and magnified image of an object placed 8 cm from the lens? Draw a ray diagram to justify your answer.

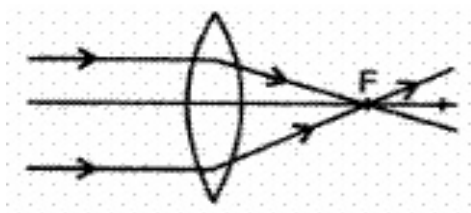
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Answer

Section A

1.
$$2\text{CuS} + 3\text{O}_2 \rightarrow 2\text{CuO} + 2\text{SO}_2$$

copper (II) sulfide *copper oxide* *sulfur dioxide*
2. Atomic number of Nitrogen is 7 and its electronic configuration is 2,5. So, Nitrogen easily accepted 3 electron complete its octaves. So valency of Nitrogen is 3.
3.
 - i. It is a renewable source of energy.
 - ii. To produce electricity, solar panels are used.
 - iii. The three advantages of solar cells are as follows:
 - a. Have no moving parts.
 - b. Require little maintenance.
 - c. It can be set up in remote areas.
 - iv. Solar cooker surface is painted with black because it is better absorber of heat.
4.
 - a. Diabetes
 - b. (b) Insulin
 - c. (iv) low sugar high fibre diet
 - d. (i) 180mg/dL



5. (a)

Explanation: All rays passing parallel to the axis will pass through the focus after refraction in the lens.

OR

(b) Very near to the focus

Explanation: In torches, search lights and head lights of vehicles, the bulb is placed very near to the focus. Since the reflector of torches, search lights and head lights are concave in shape; the reflected light forms a parallel beam and travels a large

distance.

6. (a) Afforestation

Explanation: **Afforestation** is the establishment of a forest or stand of trees in an area where there was no previous tree cover. Forests can retain excess rainwater, prevent extreme run offs and reduce the danger from flooding

7. (d) A_1 , A_2 , A_3 and A_4

Explanation: A_1 and A_2 show same reading. A_3 and A_4 connected to 2Ω resistor each, also carry equal current which is $(\frac{I}{2})$ [Current is divided equally here].

8. (d) NaHCO_3

Explanation: Baking soda is called as **sodium hydrogencarbonate/sodium bicarbonate**.

OR

- (a) III

Explanation: The colour of pH paper in water is green, red in lemon juice as well as in diluted lemon juice.

9. (d) Garden

Explanation: An ecosystem may be classified as a natural ecosystem or a man-made ecosystem. A garden is an example of a man-made ecosystem. Deserts, rivers and grasslands are examples of natural ecosystems.

10. (c) Plastic

Explanation: Paper, wood and cloth are biodegradable. Plastic is non-biodegradable.

11. (a) Decolorizing agent

Explanation: **Activated charcoal** is activated carbon. It is a form of carbon processed to have small, low-volume pores that increases the surface area available for adsorption or chemical reactions. Activated charcoal is used as a **decolorizing agent** in the sugar industry.

12. (d) exothermic reaction Explanation:

Reaction of acid or base with water leads to the decrease in the concentration of ions ($\text{H}_3\text{O}^+/\text{OH}^-$) per unit volume. This process is known as dilution.

The procedure of dissolving acid or base in water is highly exothermic reaction.

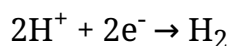
13. (c) Assertion is CORRECT but, reason is INCORRECT. Explanation: Assertion is

CORRECT but, reason is INCORRECT.

14. (b) Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion. Explanation: Both assertion and reason are CORRECT and reason is the CORRECT explanation of the assertion.

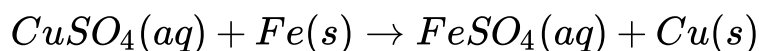
Section B

15. The reason why non-metals do not displace hydrogen from dilute acids is because unlike metals, non-metals do not have a tendency to lose electrons but to gain electrons. Metals have a tendency to lose electrons. These electrons, which are readily lost by reactive metals like sodium, potassium etc are accepted by hydrogen ions of the acids, reducing them to hydrogen gas (H_2)



However, non-metals do not lose electrons readily, because of which they do not displace hydrogen from acids. Another important point to note is that not all metals will displace hydrogen from acids. Only those metals which are reactive than hydrogen will displace H_2 from acid.

16. When an iron nail is dipped in copper sulphate solution, the more reactive iron displaces the less reactive copper from copper sulphate solution.



In this reaction, the iron nails become brownish in colour and blue colour of copper sulphate solution fades away.

OR

- i. The substance 'X' which is used in white washing is calcium oxide or quick lime and its formula is CaO .
 - ii. The reaction involve is: $CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(aq)$
17. The cause of chemical combination is the tendency of the atoms of the elements to attain an octet by gaining, losing or sharing of electrons with other atoms. Also, the formation of chemical combination between two atoms is accompanied by a decrease of energy.
18. Transpiration is the process of water movement through a plant and its evaporation

from aerial parts such as leaves, stems and flowers.

Its functions are:

OR

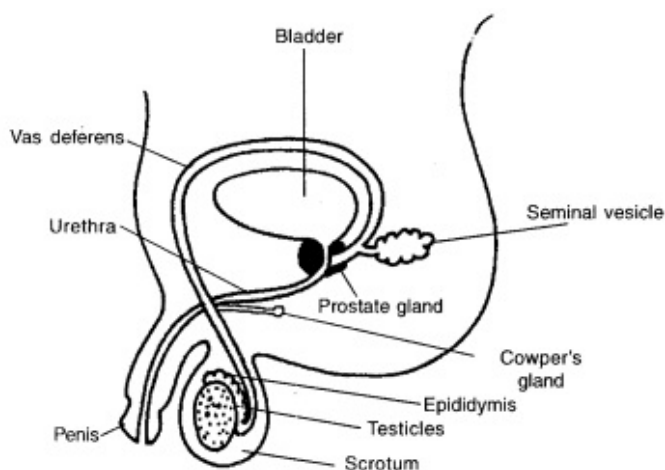
During winter, metabolism is much higher and more of excretory products are formed. They are to be eliminated. Moreover, water is lost by perspiration during summer but in winter, urination is the only way of passing excess water outside.

- a. Transporting minerals from the soil to the other parts of the plant.
- b. Maintaining turgor pressure and maintaining the temperature of the plant.

19.

Real Image	Virtual image
1. The image can be captured on screen .	1.The image cannot be captured on screen .
2.The image is always inverted	2.The image is always erect.
3. Light ray actually meet to form a real image.	3.Light ray do not meet to form a Virtual image

20. Male reproductive system



21. (i) Thyroxin- Control overall metabolic rate of the body (carbohydrate, protein and fat metabolism)
- (ii) Insulin- Conversion of glucose to glycogen in liver and muscles, thus decreases blood glucose level.
- (iii) Adrenalin- increases heart beat, blood pressure and blood glucose level.

(iv) Growth hormone- Body growth and development of bones.

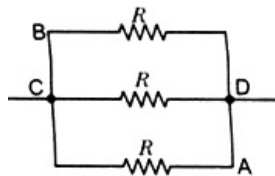
(v) Testosterone- Development of male sex organ and secondary sex characteristics like moustache, beard & voice.

22. Rate at which heat is developed in the heater is its power.

$$P = I^2 R = (15)^2 (8) = 225 \times 8 \text{ or } P = 1800 \text{ W or } \text{Js}^{-1}$$

1,800 J of heat is developed per second.

23. The point C is connected to B and the point D is connected to A. Therefore, three identical resistors, each having resistance R, are connected in parallel and the equivalent circuit diagram is shown in the figure. If the equivalent resistance is R then



$$\begin{aligned}\frac{1}{R'} &= \frac{1}{R} + \frac{1}{R} + \frac{1}{R} \\ &= \frac{3}{R} \\ \Rightarrow R' &= \frac{R}{3}\end{aligned}$$

24. $d = 0.5 \text{ mm} = 0.5 \times 10^{-3} \text{ m} = 5 \times 10^{-4} \text{ m}$; $\rho = 1.6 \times 10^{-8} \Omega \text{ m}$, $l = ?$; $R = 10 \Omega$

$$\begin{aligned}R &= \frac{R \pi d^2}{4 \rho} = \frac{10}{4} \times \frac{22}{7} \times \frac{(5 \times 10^{-4})^2}{1.6 \times 10^{-8}} \\ R &= \frac{\rho l}{A} = \frac{\rho l}{\pi d^2} = \frac{4 \rho l}{\pi d^2}\end{aligned}$$

$$l = \frac{220}{28} \times \frac{25}{1.6} = 122.77 \text{ m}$$

If the diameter of wire is doubled, resistance will become $\frac{1}{4}$ th of the original (since $R \propto \frac{1}{A}$ or $R \propto \frac{1}{d^2}$).

i. a) Shaving mirror- Concave mirror

b) Rear view mirror - Convex mirror

c) Reflection in search-lights - Concave mirror.

ii. The three differences are:

a) Real image can be obtained on screen but a virtual image cannot be obtained.

b) Reflected/Refracted rays actually meet where the real image is formed while for

virtual they only appear to meet.

c) A Real image is always inverted while the virtual image is always erect.

Decrease of resistance will be $10 - \frac{10}{4} = 7.5 \text{ ohm}$

OR

Section C

25. i. The p in pH stands for "**potenz**" which means **power** in German. pH is a number which indicates the acidic or basic nature of a solution.
- ii. Water will turn universal indicator solution green as its pH value is 7.
- iii. As the pH value of solution A is 3.0, i.e. acidic in nature hence, it turns litmus solution from blue to red and phenolphthalein indicator in basic medium change its color to pink.

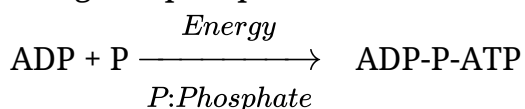
26.

Elements	Outermost electrons	Group No.
A	1	1 st
B	3	13 th
C	5	15 th
D	7	17 th

The electronic configuration of B = 2, 8, 3 and D = 2, 8, 7

The valency of B is 3 and valency of D is 1. Therefore when B and D combine, the molecular formula is BD₃.

27. **ATP:** ATP is the energy currency for most cellular processes. The energy released during the process of respiration is used to make an ATP molecule from ADP and inorganic phosphate.



Endothermic processes in the cell then use this ATP to drive the reactions. When the terminal phosphate linkage in ATP is broken using water, the energy equivalent to 30.5 kJ/mol is released.

Think of how a battery can provide energy for many different kinds of uses. It can be

used to obtain mechanical energy, light energy, electrical energy and so on. Similarly, ATP can be used in the cells for the contraction of muscles, protein synthesis, conduction of nervous impulses and many other activities.

28.

OR

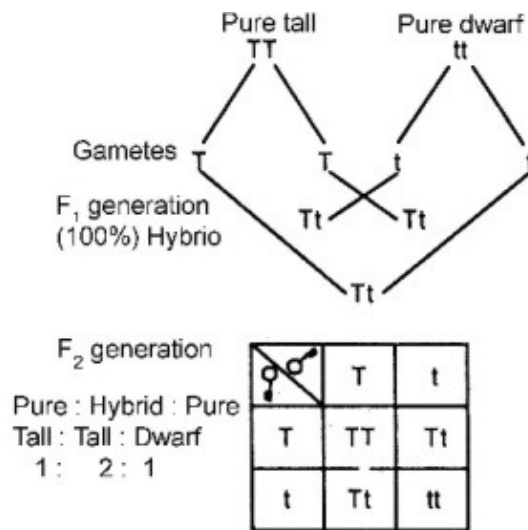
Law of dominance is known as the first law of inheritance. Each character is controlled by distinct units called factors, which occur in pairs. If the pairs are heterozygous, one will always dominate the other.

Law of dominance explains that in a monohybrid cross between a pair of contrasting traits, only one parental character will be expressed in F₁ generation and both are expressed in F₂ generation in the ratio 3:1. The one which expressed in F₁ generation is called dominant trait and the one which is suppressed is called recessive trait. In simple words, the law of dominance states that recessive traits are always dominated or masked by dominant trait.

The law can be well explained by the monohybrid cross by studying the following crosses:

- a. The Occurrence of differences between organisms is called variation. Genetic variation can be caused by mutation which can create entirely new alleles in a population. Species having suitable variations have more chances of survival in case of change in environmental conditions.
- b. Offspring and parents of organism reproducing sexually have the same number of chromosomes because in sexually reproducing organisms male and female gametes/reproductive cells with only half the number of chromosomes (as in the parent cell) are produced. During fertilization, when male and female gametes fuse to give rise to a zygote, original number of chromosomes are restored.
- c. Pure tall = TT, Hybrid tall = Tt
Gametes of TT parent = $\frac{1}{2}T + \frac{1}{2}T$
Gametes of Tt parent = $\frac{1}{2}T + \frac{1}{2}t$
The 50% are pure tall and 50% hybrid tall. Then pure tall plants will produce 100% tall in F₂ generation and hybrid plants will produce in the ratio of 1 : 2 : 1 in the F₂ generation.
- d. When the cross is made between pure tall and pure dwarf, we get results as

follows



29.

Its magnitude is constant and flows in one direction only.	Its magnitude and direction reserves periodically.
The frequency of D. C. is zero.	The frequency of A. C. is non-zero.

i. Graph A represent D.C. and graph B represent A.C.

ii. Source of (A) - Dry cell

Source of (B) - A.C. generator

iii. For graph (B)

$$f = \frac{1}{T} = \frac{1}{0.02}$$

$$f = 50\text{Hz}$$

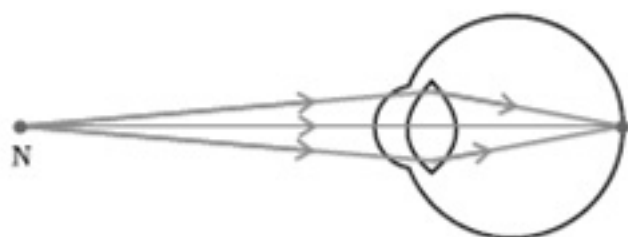
iv.

30. Myopia: The defect of an eye in which it cannot see the distant objects clearly is called myopia. A person with myopia can see nearby objects clearly.

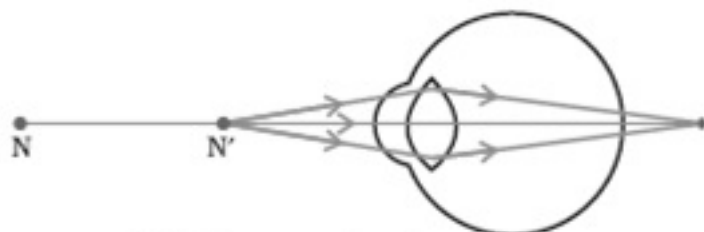
Hypermetropia: Hypermetropia is also known as long-sightedness. In this defect, a person can see the distant objects clearly but cannot see the nearby objects clearly.

Causes of Hypermetropia:

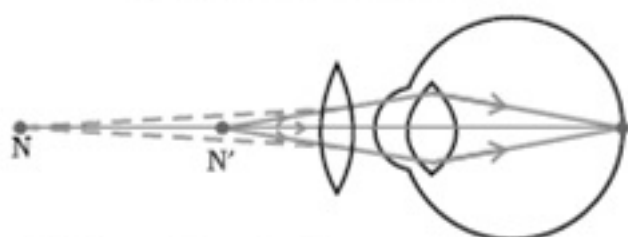
In hypermetropia, the image of a distant object is formed behind the retina and not on the retina. The defect is corrected by using the Convex lens of suitable power so that the lens will bring the image back on to the retina. The ray diagram of hypermetropia eye are as follows:



(a) Near point of a Hypermetropic eye



(b) Hypermetropic eye



(c) Correction for Hypermetropic eye

OR

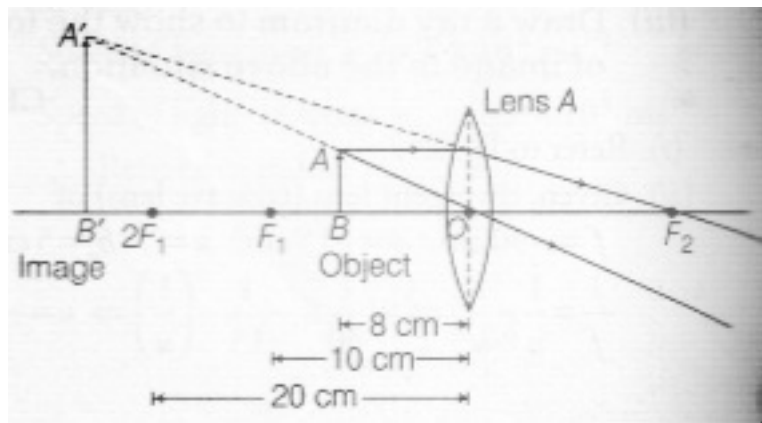
The ability of a lens to converge or diverge light rays is called power of the lens. It is defined as the reciprocal of focal length. Its SI unit is dioptre (D). If focal length is expressed in metres, then power is expressed in dioptre. We can say, dioptre is the power of a lens whose focal length is one metre. For concave lens P and f are negative. For convex lens P and f are positive. Lens A of focal length + 10 cm is convex lens

and power, $P = \frac{100}{f(\text{in cm})} = \frac{100}{10} = +10D$

Lens B of focal length - 10 cm is concave lens

and power, $P = \frac{100}{f(\text{in cm})} = \frac{100}{-10} = -10D$

Lens A (i.e. convex lens) will form a virtual and magnified image of an object placed 8 cm from it, as shown.



- i. The focal length of the eye lens is too long.
- ii. The eyeball has become too small.